

Appl. No. 10/811,415
Amdt. Dated June 13, 2007
Reply to Office Action of March 14, 2007

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REMARKS**Status of Claims**

Claims 2, 7-8, 10, 12, 14 and 16 are previously presented; claims 3-6, 9, 11 and 15 are remained unchanged; claims 1 and 13 are currently amended; and claim 17 is new. Support for the changes to claims 1 and 13 and the newly added claims 17 can be found in the drawings, as originally filed. Specifically, it can be seen from, e.g., FIGS. 6 and 7 that the cathode is a single element with a flat continuous surface, is able to accommodate the entire carbon nanotube array, and is opposite to the substrate.

Double Patenting Rejections

Claims 1, 2, 8, 13 and 14 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 2 of copending Application No. 10/810,151 (now U.S. Patent No. 7,115,013).

In response to this rejection, attached herewith is a copy of a Terminal Disclaimer, duly signed by the registered agent of the Applicants. Accordingly, it is believed that the rejection is overcome.

Claim Rejections - 35 USC §103

Claims 1, 3-6, 13, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (2003/0027478 A1) in view of Dai et al. (US 6,232,706).

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In response thereto, Applicants have amended claims 1 and 13 and, otherwise, respectfully traverse the rejection of such claims and assert that the rejected claims are patentable.

Claim 1, as current amended, recites in part:

A method for making a carbon nanotube-based field emission device comprising steps of:

providing a substrate having a flat surface; ...

forming a single cathode electrode having a continuous flat surface
on a top of the carbon nanotube array; and
removing the substrate so as to ... (Emphasis added.)

Applicants submit that the method for making a carbon nanotube-based field emission device as set forth in current amended claim 1 is neither taught, disclosed, nor suggested by Park et al. '478, Dai et al. '706, or any of the other cited references, taken alone or in combination.

Park et al. '478, in part, discloses the step of forming a plurality of distinct cathode electrodes (15), each being on a top of a corresponding carbon nanotube array (17), after such carbon nanotube arrays (17) have been grown on a substrate (18). However, Park et al. '478 clearly fails to disclose or suggest "a single cathode electrode having a continuous flat surface on a top of the carbon nanotube array", as particularly required by

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claim 1, as amended.

Dai et al. '706 discloses a method of growing self-aligned CNT's array over the surface of a smooth substrate by providing a catalyst layer on a selected area of the smooth surface of the substrate. Dai et al. '706 also fails to disclose or suggest the step of forming a single cathode electrode on a top of the carbon nanotube array. In Dai et al. '706 the substrate 22 acts as a cathode at same time and is provided before the carbon nanotube array is formed. Therefore, a combination of Park et al. '478 and Dai et al. '706 fails to disclose or suggest all the limitations of current amended claim 1.

Furthermore, the cathode (15) in Park et al. '478, indeed cannot have a continuous flat surface in the context claimed. Actually, Park et al. '478 provides separately distributed conductive columns (15) (as shown in Fig. 3B) as a template to obtain separately distributed CNT field emitters. CNT field emitters must be separately distributed in a useful field emission device application such as a field emission display, that it is to say, the conductive columns (15) must be separated. Therefore, there is no existing need/use to replace the separately distributed conductive columns (15) in Park et al. '478 with a single cathode having a continuous flat surface, as per amended claim 1. Dai et al. '706 is unable to overcome such a deficiency.

Accordingly, Applicants submit that the combination of Park et al. '478 in view of Dai et al. '706 fails to teach or suggest the method for manufacturing the carbon nanotube-based field emission device as set forth in currently amended claim 1. Therefore, currently amended claim 1

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clearly recites novel and unobvious physical subject matter over Park et al. '478 in view of Dai et al. '706 or any of the other cited references, taken alone or in combination.

Applicants submit that the novel and unobvious physical features of claim 1 produce new and unexpected results over and above Park et al. '478, Dai et al. '706 or any of the other cited references, taken alone or in combination. The new and unexpected results related to the claimed method for manufacturing carbon nanotube-based field emission device are associated with the flat continuous surface of the cathode receiving the carbon nanotube array. Because separately distributed conductive columns are not needed in the claimed method, a complex manufacturing process can be avoided.

Furthermore, the carbon nanotube array is in direct contact with the cathode, and, therefore, the claimed method has better electrical connection between the carbon nanotube array and the cathode. A field emission device made by the claimed method also has better reliability.

In summary, it is submitted that current amended claim 1 is unobvious and patentable over Park et al. '478, Dai et al. '706, or any of the other cited references, taken alone or in combination, under § 103.

Dependent claims 3-6 and 7, respectively, incorporate all the subject matter of independent claim 1 and add respective additional subject matter. As detailed above, it is asserted that currently amended claim 1 is allowable. Thus, it is submitted that the dependent claims claims 3-6 and 7, are also

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allowable, and Applicants request that the rejection relating thereto be removed.

Claim 13, as current amended, recites in part:

A method for making a carbon nanotube-based field emission device comprising steps of: ...

depositing a single layer of metallic material having a flat continuous surface on a top of the carbon nanotube array; and

removing ... (Emphasis added.)

Applicants submit that the method for manufacturing the carbon nanotube-based field emission device as set forth in currently amended claim 13 is neither taught, disclosed, nor suggested by Park et al. '478, Dai et al. '706, or any of the other cited references, taken alone or in combination.

For reasons similar to those asserted above in relation to the rejection of claim 1 under 35 U.S.C. § 103 on Park et al. '478 in view of Dai et al. '706, Applicants submit that subject matter as set forth in claim 13 is neither taught, disclosed, nor suggested by Park et al. '478, Dai et al. '706, or any of the other cited references, taken alone or in combination.

Therefore, current amended claim 13 is unobvious and patentable over Park et al. '478, Dai et al. '706 or any of the other cited references under § 103.

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Dependent claims 14-16 incorporate all the subject matter of independent claim 13 and add respective additional subject matter. As detailed above, it is asserted that claim 13 is allowable. Thus, it is submitted that the dependent claims 14-16 are also allowable, and Applicants request that the rejection relating thereto be removed.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (2003/0027478 A1) in view of Dai et al. (US 6,232,706), and further in view of Jin (US 6,286,226).

Dependent claim 7 incorporates all the subject matter of independent claim 1 and adds respective additional subject matter. As detailed above, it is asserted that claim 1 is allowable. Thus, it is submitted that the dependent claim 7 are also allowable, and Applicants request that the rejection relating thereto be removed.

Claim objections

Claims 9-12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants submit that claim 8 is now allowable as the non-statutory double patenting rejection is overcome; therefore claims 9-12 are also allowable now.

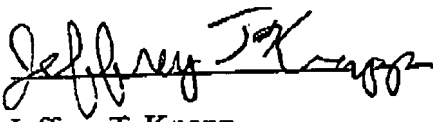
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Conclusion

For all the above reasons, applicants assert that all the pending claims are now in proper form and are patentably distinguishable over the prior art. Therefore applicants submit that this application is now in condition for allowance, and an action to this effect is earnestly requested.

Respectfully submitted,
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